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MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole
Log Data Report

Log Event A

Borehole 50-03-06

Borehole Information

Farm :	T	**Tank :**	T-103	**Site Number :**	299-W10-145
N-Coord :	43,603	**W-Coord :**	75,847	**TOC Elevation :**	670.00
Water Level, ft :	Full	**Date Drilled :**	1/31/1975		

Casing Record

Type :	Steel-welded	Thickness, in. :	0.237	ID, in. :	4
Top Depth, ft. :	0	Bottom Depth, ft. :	124		
Type :	Steel-welded	Thickness, in. :	0.280	ID, in. :	6
Top Depth, ft. :	0	Bottom Depth, ft. :	124		

Cement Bottom, ft. : 124 **Cement Top, ft. :** 0

Borehole Notes:

Borehole 50-03-06 was drilled in January 1975 to a depth of 99 ft with 6-in. casing. In May 1977, the borehole was deepened to 125 ft and the 6-in. casing was extended to a depth of 124 ft. The 6-in. casing was perforated from 0 to 20 ft and 70 to 124 ft. A 4-in. casing liner with a metal cap welded on the bottom was positioned inside the 6-in. casing. Although no information concerning grouting was provided in the drilling log or Chamness and Merz (1993), it is assumed the entire annulus between the 4-in. and 6-in. casings was filled with grout. Annular grouting was part of the procedure used during the 1977 campaign to deepen selected boreholes in the T Tank Farm. In addition, the logging engineer reported that grout was visible between the casings at the ground surface. The thicknesses of the 4-in. and 6-in. casings are presumed to be 0.237 in. and 0.280 in., respectively, on the basis of the published thickness for schedule-40, 4-in. and 6-in. steel tubing.

Equipment Information

Logging System :	1B	**Detector Type :**	HPGe	**Detector Efficiency:**	35.0 %
Calibration Date :	11/1997	**Calibration Reference :**	GJO-HAN-20	**Logging Procedure :**	MAC-VZCP 1.7.10-1

Logging Information

Log Run Number :	1	**Log Run Date :**	03/25/1998	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	0.0	**Counting Time, sec.:**	200	**L/R :** L **Shield :**	N
Finish Depth, ft. :	13.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	2	**Log Run Date :**	03/31/1998	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	12.0	**Counting Time, sec.:**	200	**L/R :** L **Shield :**	N
Finish Depth, ft. :	67.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Event A

Borehole # 50-03-06

Log Run Number :	3	**Log Run Date :**	04/01/1998	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	122.5	**Counting Time, sec.:**	200	**L/R :** L	**Shield :** N
Finish Depth, ft. :	66.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Logging Operation Notes:

This borehole was logged by the SGLS in three log runs using a 200-s counting time. The top of the borehole casing, which is the zero reference for the SGLS, is approximately flush with the ground surface. The total logging depth achieved was 122.5 ft.

Analysis Information

Analyst : E. Larsen

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 07/06/1998

Analysis Notes :

The pre-survey and post-survey field verification for each logging run met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from the accepted calibration spectrum that most closely matched the field data were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation.

This borehole was completed with 4-in.- and 6-in.-diameter casings along the entire logged interval. A casing correction factor for a 0.50-in.-thick steel casing was applied to the concentration data because it most closely matched the 0.517-in. total combined thickness of the 4-in. and 6-in. casings. The entire annulus between the 4-in. and 6-in. casings is likely filled with grout, making it impossible to produce accurate radionuclide assays. However, man-made and natural radionuclides were identified and apparent concentrations are reported.

This borehole was completely filled with water at the time of logging. The appropriate water correction factor was not available, so no compensation was applied, resulting in lower reported man-made and natural radionuclide concentration values along the entire logged interval.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the estimated uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A time-sequence plot of the historical gross gamma log data from 1975 to 1994 is presented with the SGLS log plots.

Log Event A

Borehole 50-03-06

Results/Interpretations:

The radionuclide concentrations identified in this section are reported as only apparent concentrations and are underestimated.

The man-made radionuclides Cs-137, Co-60, and Eu-154 were detected by the SGLS. The Cs-137 contamination was detected continuously from the ground surface to 10 ft and 12 to 12.5 ft. A single occurrence of Cs-137 was also detected at 97.5 ft. The Co-60 contamination was measured nearly continuously from 66 to 95 ft. A small zone of Co-60 was detected from 109.5 to 110 ft. Numerous occurrences of Eu-154 contamination were detected between 67.5 and 82 ft.

Increased K-40 and Th-232 concentrations occur from 78 to 90.5 ft. Sharply decreased K-40 concentrations and slightly decreased Th-232 concentrations occur from 90.5 to 96 ft and 99.5 to 104 ft. A sharp peak in the U-238 concentrations was detected at 102.5 ft. The K-40 and Th-232 concentration values increase from about 108 to 110 ft and generally remain elevated to the bottom of the logged interval.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Reports for tanks T-103 and T-106.